Check List
Journal of Species Lists and Distribution

ISSN 1809-127X (online edition)
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LISTS OF SPECIES

Zooplankton of an urban stretch, Itapecerica river, Divinópolis, Minas Gerais, Brazil

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Abstract: The aim of this project was to study the zooplanktonic composition of the Itapecerica river in its 29km urban section across the city of Divinópolis, state of Minas Gerais. Eight sampling points were established within this section, six in lotic and two in lentic waters. Samples were taken monthly from March/2002 to February/2003 totalizing 84 samples. A plankton net with a mesh opening size of 35 µm was utilized for sampling. Temperature, pH, dissolved oxygen and electrical conductivity measurements were also taken during sampling. 101 taxa were registered, of which 35 were Protozoa, 52 Rotifera, 10 Cladocera and four Copepoda. The number of taxa was considered high when compared to similar studies. Among the richest group, rotifers, the most expressed genera were *Lecane* and *Brachionus*. This study recorded the first appearance of the exotic species *Kellicottia bostoniensis* (Rousselet 1908) for the sub-basin of Itapecerica river.

Introduction

The diversity of plankton in freshwater has been poorly studied and is less well known than marine environments. As a result, the Diversitas Program of UNESCO (United Nations Educational, Scientific and Cultural Organization), recognizing the existence of this gap, elected freshwater biodiversity as a special target for studies of biodiversity in the coming years (Rocha 2005).

In Brazil, limnological studies are relatively recent, and still verify the composition of the zooplankton community in our aquatic environments, especially lotic environments. Scientific studies are scarce in the area surrounding municipality of Divinópolis, state of Minas Gerais, southeastern Brazil, limited to a few reports by IGAM (Minas Gerais Water Management Institute).

Plankton is the community that lives suspended in water and is characterized by its small size, ranging from few micrometers to few millimeters. According to their nature, they are distinguished into three categories: bacterioplankton, phytoplankton and zooplankton (Sipaúba-Tavares 1995).

The zooplankton community of freshwater environments is composed mainly by rotifers, microcrustaceans (cladocerans and copepods) and protozoa (Hutchinson 1967), of which rotifers generally presents the largest diversity of species (Ruttner-Kolisko 1974; Vasquez 1984).

According to Maia-Barbosa et al. (2006) knowledge of zooplankton species has been a powerful tool to assess changes in aquatic ecosystems caused by impacting activities: introduction of exotic species, silting and contamination by industrial and domestic sewage, among others. The author also emphasizes the importance of work involving survey of species from rivers in the state of Minas Gerais.

The aim of this project was to study the zooplanktonic composition of an urban stretch of the Itapecerica river. It is common sense that the best knowledge of the structure of a functioning urban biotope is of a vital significance to its best use and occupation.

Materials and Methods

Study Site

The Itapecerica river is a tributary within the sub-basin of the Pará river, one of the most important basins of the São Francisco river. The river rises in the city of Itapecerica, with the name of *Rio Vermelho*, and past the junction of the rivers Gama

and Santo Antônio, it is named Itapecerica river. The river goes through three municipalities crossing Divinópolis in a stretch of 29 km.

The municipality of Divinópolis, state of Minas Gerais, southeastern Brazil (20°08'21"S, 44°53'17" W) in the upper San Francisco region has its climate classified as Cwa mesothermic, characterized by a dry (April to September) and a rainy season (October to March) (Ometo 1981).

The Itapecerica river, crossing the urban area of Divinópolis, serves as outlet for domestic and industrial sewage. Besides polluting the Itapecerica river, Divinópolis increases the degree of pollution of the Pará river, one of the tributaries of the São Francisco river. The domestic, industrial and hospital sewage dumped in the river causes numerous outbreaks of various diseases. (Brasil 2008).

Data Analysis

Samples were collected in eight points of the Itapecerica river (six lotic points and two lentic points) monthly, from April 2002 to March 2003. In lentic environments a vertical drag was carried with a plankton net of 35 µm mesh size. One hundred liters of water were filtered in each lotic environment using a bucket of 10 liters of capacity and then concentrated on plankton net of 35 µm mesh size. This sampling was made on the surface, approximately 50 cm from the margin. After filtration and conditioned in polyethylene bottles, the samples were stained with Rose Bengal and after 15 minutes they were fixated with 4 % formalin. Analysis was done by taxonomic identification of the organisms whenever possible to the species level. Those reviews were supported by the following taxonomic keys: Koste (1978), Loureiro (1997), Lee et al. (1996) and Ogden and Hedley (1980).

Results and Discussion

The zooplankton community of the Itapecerica river was represented by 101 taxa: 35 Protozoa, 52 Rotifera, 10 Cladocera and four Copepoda. In studies by Barany et al. (2002); Serafin-Júnior et al. (2006) the number of zooplankton species found in longer stretches of rivers than in the present study was lower than the 101 taxa found by us in the 29 km stretch. This is probably due to the heterogeneity of collection environments: stretches with higher and lower flow, and stretches of stagnant water puddles near the margin and above the dams.

Temperature and pH values in Itapecerica river followed seasonal patterns. Electrical conductivity had an increase of its values in places with anthropic disturbance. The opposite happened with the dissolved oxygen. (Table 1).

The species *Kellicottia bostoniensis* (Rousselet 1908) (Rotifera: Monogononta: Brachionidae) found in the Itapecerica river is considered an invasive species. According to José de Paggi (2002) the species was first recorded in South America in the 1990's, in the Reservoir of Segredo, Iguaçu river. This is the first record for Itapecerica river, sub-basin of the river Pará. The record of this species is extremely important for monitoring the progression of its invasion in the country. According to Landa et al. (2002) the species is typical of eutrophic environments.

In the work of Paggi and José de Paggi (1990); Lansac-Tôha et al. (1992); Kobayashi et al. (1998); Salibián (2006) and Serafin-Junior et al. (2006), the rotifers are the most representative in the composition of rivers. The same was found in Itapecerica river with 53 representatives of the group Rotifera. The most abundant genus was *Lecane* (13), followed by *Brachionus* (7) and *Trichocerca* (6). Lansac-Tôha et al. (1997) in their studies in the floodplain of the river Paraná, obtained similar results, with greater number of the genus *Lecane*, followed by *Trichocerca* and *Brachionus*. Genera *Brachionus*, *Lecane*, *Lepadella* and *Trichocerca* have a great number of species in tropical fauna, as observed by Lucinda (2003). The pattern of richness found (greater number of rotifers, followed by cladocerans and copepods) was also found by Neves et al. (2001) in a lotic environment.

A list of species for the Itapecerica river is provided. Lists are an useful tool to monitoring changes in composition of the plankton as anthropic influence may increase through time.

Zooplankton species of the Itapecerica river, Divinópolis, state of Minas Gerais:

PHYLUM Sarcomastigophora
CLASS Lobosea
ORDER Arcellinida
FAMILY Arcellidae
Arcella conica Deflandre, 1926
Arcella costata Ehrenberg, 1847
Arcella dentate Ehrenberg, 1838
Arcella discoides Ehrenberg, 1871

Arcella gibbosa Pénard, 1893
Arcella hemisphaerica Perty, 1852
Arcella megastoma Pénard, 1913
Arcella vulgaris Ehrenberg, 1830

FAMILY Difflugiidae
Lesquereusia spiralis (Ehrenberg) Butschli, 1880
Difflugia acuminate Ehrenberg, 1838
Difflugia corona Wallich, 1864
Difflugia globulosa Dujardin, 1837
Difflugia limnetica Pénard, 1912
Difflugia lobostoma Leidy, 1877
Difflugia oblonga Ehrenberg, 1838
Difflugia pyriformis Ehrenberg, 1838
Difflugia urceolata Carter, 1864
Netzelia oviformis (Cash, 1909) Odgen, 1979

FAMILY Centropyxidae
Centropyxis *aculeata* (Ehrenberg, 1830) Stein, 1859
Centropyxis *constricta* Ehrenberg, 1841
Centropyxis *ecornis* Ehrenberg, 1841

CLASS Filosea
ORDER Gromiida
FAMILY Euglyphidae
Euglypha acanthophora Ehrenberg, 1841
Euglypha laevis Perty, 1849

FAMILY Cyphoderridae
Cyphoderia ampulla Ehrenberg, 1840

PHYLUM Ciliophora
CLASS Spirotrichea
ORDER Heterotrichida
FAMILY Stentoridae
Stentor sp.

ORDER Oligotrichida
FAMILY Halteriidae
Halteria sp.

ORDER Stichotrichida
FAMILY Urostylidae
Urostyla sp.

CLASS Litostomatea
ORDER Haptorida
FAMILY Didiniidae
Monodinium sp.

CLASS Nassophorea
ORDER Peniculida
FAMILY Lembadionidae
Lembadion sp.

FAMILY Lembadionidae
Paramecium sp.

CLASS Oligohymenophorea

ORDER Scuticociliatida
FAMILY Pleuronematidae
Pleuronema sp.

ORDER Sessilida
FAMILY Epistylididae
Campanella umbellaria Linnaeus, 1767
Epistylis sp.

FAMILY Vorticellidae
Vorticella sp.

ORDER Mobilida
FAMILY Trichodinidae
Trichodina sp.

PHYLUM Aschelminthes
CLASS Rotifera
ORDER Ploimida
FAMILY Brachionidae
Brachionus angularis Gosse, 1851
Brachionus bidentata Anderson, 1889
Brachionus calyciflorus Pallas, 1766
Brachionus dolabratus Harring, 1915
Brachionus falcatus Zacharias, 1898
Brachionus forficula Wierzejski, 1891
Brachionus patulus O.F. Muller, 1786
Platyias quadricornis Ehrenberg, 1832
Keratella americana Carlin, 1943
Keratella cochlearis Gosse, 1851
Keratella lenzi Hauer, 1953
Keratella tropica Apstein, 1907
Kellicottia bostoniensis Rousselet, 1908
Anuraeopsis fissa Gosse, 1851

FAMILY Euchlanidae
Euchlanis dilatata Ehrenberg, 1832
Dipleuchlanis sp.

FAMILY Trichotriidae
Macrochaetus sericus Thorpe, 1893

FAMILY Colurellidae
Colurella uncinata O.F. Muller, 1773
Lepadella ovalis O.F. Muller, 1786
Lepadella patella O.F. Muller, 1786

FAMILY Lecanidae
Lecane arcuata Bryce,1891
Lecane bulla Gosse, 1886
Lecane hastata Murray 1913
Lecane glypta Harring &Myers, 1926
Lecane hamata Stockes,1896
Lecane leontina Turner, 1892
Lecane levistyla Olofsson, 1917
Lecane lunaris Ehrenberg, 1832
Lecane ovalis Jakubski, 1914
Lecane quadridentata Ehrenberg, 1892
Lecane scutata H.&M., 1926

Lecane stenroosi Meissner, 1908
Lecane sp.

FAMILY Proalidae
Proales sp.

FAMILY Notommatidae
Cephalodella gibba Ehrenberg, 1838
Notommata copeus De Beauchamp, 1908
Notommata sp.

FAMILY Trichocercidae
Trichocerca longiseta Schrank, 1802
Trichocerca minuta Olofsson, 1918
Trichocerca pussila Lauterborn 1898
Trichocerca similis Wierzejski 1893
Trichocerca stylata Gosse 1851
Trichocerca sp.

FAMILY Synchaetidae
Synchaeta sp.
Polyarthra dolichoptera Idelson, 1925
Polyarthra vulgaris Carlin, 1943
FAMILY Asplanchnidae
Asplanchna priodonta Gosse, 1850

ORDER Gnesiotrocha
FAMILY Testudinellidae
Testudinella patina Hermann, 1783

FAMILY Conochilidae
Conochilus dossuarius Hudson, 1875

FAMILY Hexarthridae
Hexarthra intermedia Hauer 1953

FAMILY Filiniidae
Filinia longiseta Ehrenberg, 1834
Filinia terminalis Plate, 1886

PHYLUM Arthropoda
CLASS Crustacea
ORDER Ctenopoda
FAMILY Sididae
Diaphanosoma birgei Korinek, 1981

FAMILY Daphinidae
Ceriodaphnia cornuta Sars, 1885
Ceriodaphnia rigaudi Richard, 1894

FAMILY Moinidae
Moina minuta Hansen, 1899

FAMILY Bosminidae
Bosmina hagmani Stingelin, 1904
Bosmina longirostris O.F. Muller, 1785
Bosmina sp.

FAMILY Macrotricidae
Macrothrix sp.

FAMILY Chydoridae
Acroperus sp.
Alona sp.

ORDER Cyclopoida
FAMILY Cyclopidae
Thermocyclops decipiens Kiefer, 1929
Thermocyclops minutus Lowndes, 1934
ORDER Calanoida
FAMILY Diaptomidae
Notodiaptomus sp.
ORDER Harpacticoida
FAMILY Canthocamptidae
Attheyella fuhrmani Thieband, 1914

Table 1. Physical chemical parameters of the Itapecerica river, Divinópolis, state of Minas Gerais, southeastern Brazil.

Variable	Minimum	Maximum	Mean
Electrical conductivity (25 °C Āmho/cm-1)	21.0	70.0	41.7
pH	6.1	9.2	7.3
Water temperature (°C)	16.0	28.0	23.4
Dissolved oxygen (mg/L)	3.3	8.1	6.1

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Received: April 2009
Revised: October 2009
Accepted: November 2009
Published online: December 2009
Editorial responsibility: Andrea de Araujo